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SPSUC: SLICE, PATTERN & STYLE OF UBIQUITOUS COMPUTING

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ABSTRACT

Computing is the new era for current research. Nowadays most of the research is involved to design and develop a Ubiquitous system for better applications of the environment. In this paper we focus the Ubiquitous system and their internal components. For continuity of research for Ubiquitous computing we evolve the new paradigm of design to improve the quality of product at its modeling stage. We distinguish design paradigm in three different parts i.e. Slice, Pattern and Style. Well defined discussions are involved to give the standard definitions of these internal components. We declare all the stages of these internal terms in graphical manner. We follow the theoretical Computer Science concept for graphical design of model. The components of SPS proposal when included in Ubiquitous computing environment suit well for better applications. This proposal refines the design paradigm of Ubiquitous systems and improves the system for enhanced application control.

KEYWORDS: Ubiquitous Computing, Design Paradigm, Slice, Pattern, Style

INTRODUCTION

Basics

By Ubiquitous computing we will not only be connected always, from everywhere, but we are approaching a time where smart devices will take actions by predicting user inputs. It is a short distance from mobility to ubiquitous computing. Mobility took computers from the desktop and put them on your lap and in your palm and pocket. Ubiquitous computing sends information seamlessly into your environment, where numerous tiny devices monitor you, connect with you, and even think for you. "Anywhere and anytime just with a blink of your eyes" this certainly seems to define the ultimate motto of pervasive computing. [1]

Ubiquitous means existing or being everywhere, every time for everyone.

Computing is any goal-oriented activity. It contain of designing, developing, structuring, and managing various kinds of information making computer systems behave intelligently.

System can be defined as a purposeful structure that consists of interrelated and interdependent elements (components, entities, factors, members, parts etc.). These elements continually influence one another (directly or indirectly) to maintain their activity and the existence of the system in order to achieve the goal of the system.

Hence, **Ubiquitous Computing System** can be define as learning environments in which we all can have access to a variety of digital devices and services, including computers connected to the Internet and mobile computing devices, whenever and wherever they need them. Our notion of ubiquitous computing, then, is more focused on many-to-many than one-to-one or one-to-many, and includes the idea of technology being always available but not itself the focus of learning

[2,3]. Ubiquitous computing devices are not personal computers, but very tiny -even invisible –devices, either mobile or embedded in almost any type of object imaginable [4]. In other words, Ubiquitous computing can be defined as the method of enhancing computer use by making many computers available throughout the physical environment, but making them effectively invisible to the user.

Concept behind UC

The technology is encroaching beyond the personal computer to everyday devices with embedded technology and connecting with smaller and more powerful computing devices. Also called *ubiquitous computing*, pervasive computing is the result of computer technology advancing at exponential speeds - a trend toward all man-made and some natural products having hardware and software. Pervasive Computing goes a step ahead of personal computers. An idea in which every device from clothes to network devices, appliances, cars, home even the human body itself can be embedded with chips to connect to devices to form an infinite network of communicating devices. The pervasive computing perspective combines current network technologies with wireless computing, Internet capability, voice recognition and Al to create an unobtrusive and always available environment [5].

Pervasive computing relies on the convergence of wireless technologies, advanced electronics and the Internet. The goal of researchers working in pervasive computing is to create *smart* products that communicate unobtrusively. The products are connected to the Internet and the data they generate is easily available.

Figure 1: Ubiquitous Computing

- **Ubiquity:** Is the property of being everywhere, omni-present, pervasive or universal.
- **Activity**: Is the act of calculation or generation of an output based on input. It can be carried out by a person alone or with the support of technology
- **Interaction**: In ubiquitous computing systems there is "multi-device interaction", but it is possible to create ubiquitous computing systems where the user is primarily interacting with one device.

UBIQUITOUS SYSTEMS

Definition

Ubiquitous computing (ubicomp) is an advanced computing concept where computing is made to appear everywhere and anywhere. In contrast to desktop computing, ubiquitous computing can occur using any device, in any location and in any format. A user interacts with the computer, which can exist in many different forms - laptop, tablets, terminals, phones, etc. The underlying technologies to support ubiquitous computing include Internet, advanced

middleware, operating system, mobile code, sensors, microprocessors, new I/O (input / output), new user interfaces, networks, mobile protocols, location and positioning, new materials, etc.

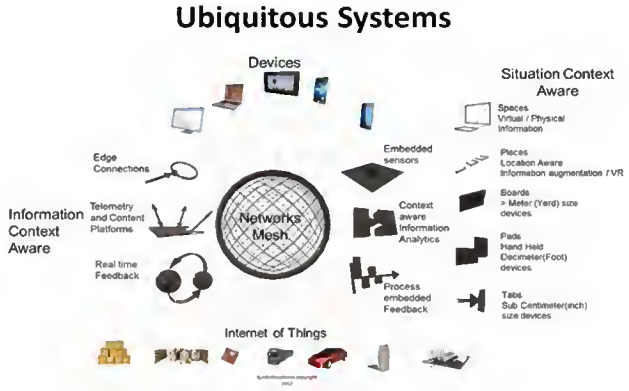

Figure 2: Graphical Representation of Ubiquitous Systems [6]

The essential components of Ubiquitous Systems requires an acting body to interact with technological devices of system to a computer i.e. Laptops, phones, tablets, PC, Network, Speakers, automated vehicles etc.

Confidentiality in Ubiquitous Computing

Privacy advocates are concerned about the "big brother is watching you" aspects of pervasive computing, but from a practical standpoint, most researchers feel it will improve efficiency [7]. In a 1996 speech, Rick Belluzo, who was then executive VP and general manager of Hewlett-Packard, compared pervasive computing to electricity. He described it as being "the stage when we take computing for granted. We only notice its absence, rather than its presence."

Some objects of Ubiquitous computing, like wearable computers, increase the chances of being under surveillance round the clock or most of the time. This can be a big concern as an individual's privacy can get interfered with.

Another big concern can be the reliability factor. Today, we have electronics like televisions, washing machines and telephones, which are tested against time and these machines, can almost be considered fully reliable; but when we look at the present day computers, they are not as reliable as the aforementioned ones. Though things are improving at a very fast rate, but even then with small computers or chips installed everywhere, it might become impossible to maintain them for a really long time.

ADVANTAGES & DISADVANTAGES

Advantages

- Development of an intelligent environment
- Ubiquitous computing enables the environment to be connected in an unobtrusive way allowing smart devices to take actions by predicting user inputs.
- It is designed to place computers into a human environment instead of making humans enter computer environments and adding extra stress to learning the process
- Real time attributes can be captured

- The inexpensive processors that are used require very little memory and have persistent storage. The processing removes complexity and allows users to be more efficient when using the computing for everyday activities or work.
- Better control on overall functionality and efficient monitoring.

Disadvantages

- **Need of Standardization**: As a variety of heterogeneous appliances, networks, applications, context-specific content, and decision support algorithms have to be connected together; every device must be written to understand the software of every other device. Some standards need to be specified. The Global ICT Standardization Forum for India (GISFI) is an Indian standardization body active in the area of information and communication technologies (ICT) and related application areas. GISFI has taken up areas such as service-oriented networks, green ICT, and the Internet of Things for major standardization efforts.
- **Privacy and Security:** When such a vast number of entities are connected, their interactions and communications are closely examined.
  - First, data from one person's device must be distinguished from data from another's.
  - Second, it is necessary to ensure that false data is not intentionally injected by some other device, masquerading as a bonafide source for that information.

  And finally, it must be rendered difficult or impossible to steal someone else's data.
- **Ethical Issues:** The information gathered is very detailed without acquiring user consent and sometimes unknowingly without user's interaction. So, certain ethical are encountered due to the use of such information.
- **Cost Considerations and Time to Construct:** The environments of users must be upgraded to support this new technology huge devices, applications, networks requires extra overhead of interconnections
- **Reliability:** Since ubiquitous devices will be everywhere, failing of such devices and unsecure software are highly unacceptable.

RESEARCH METHODOLOGY

Hypothesis: A single unit of the system configuration may change the entire properties of the system. To upgrade product quality it is essential to change the internal component of the system which requires appreciable cost and effort.

Solution: We prove that if the configured item of system is changed then the product quality is improved without incurring extra cost (as Internal Component price).

Significance of Research

- The new idea has been supplied to the researcher and analyzers i.e. every time we need not to change the internal components of the system for product quality that demands appreciable cost.
- Research scholars explore new ideas for design and deployment of ubiquitous systems.

ARCHITECTURE OF UC

Graphical design of structure for any system is known as Architecture. It is essential before the deployment of system. The Ubiquitous architecture of system is classified as:-

- Perspective
- On demand or Application based
- Consistent building

Perspective

- **Layered Architecture**
- **Topological Construction**

Layered Architecture

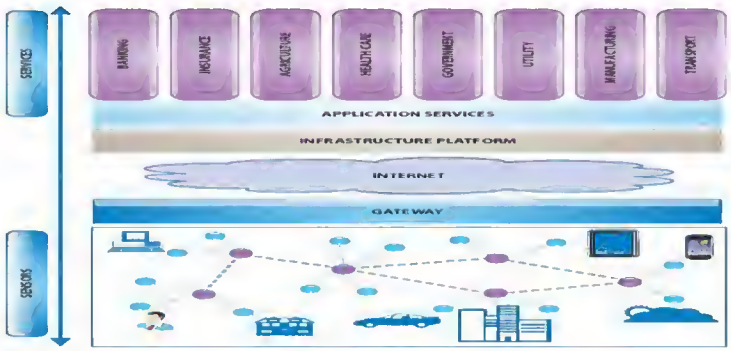

Figure 3: Ubiquitous Computing Stack [8]

At the bottom of the stack is a physical layer. Tiny sensors are attached (carried, worn, or embedded) to people, animals, machines, homes, cars, buildings, campuses, and fields. Above the sensors lies the wireless communication infrastructure, which can be provided by the 802.11 family of networks. The next level includes a range of application services. The data from the sensors and handheld devices is gathered, mined, and analyzed for patterns. The patterns help provide options to smart applications that proactively make changes to environments through smart phones, tablets, net books, notebooks, handhelds, or other smart devices.

Topological Construction

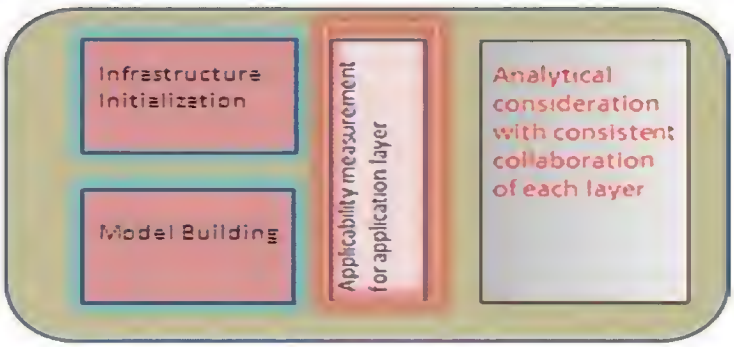

Figure 4: Topological Construction of UC Architecture

Infrastructure Initialization

- Search appropriate infrastructure
- Meetings to catch the different idea for infrastructure
- Initial setup of infrastructure
- Moderate the initial setup

Model Building

- Create model on the basis of thoughts
- Capture views
- Model evaluation through prospective view
- Deployment of model

Applicability Measurement for Application Layer

Applicability is measured through two basic parameters:-

- Infrastructure Initialization
- Model Building

It measures that how much percent of these two parameters are unified to each other.

Analytical Consideration with Consistent Collaboration of Each Layer

- Focus for initial set up of layers
- Control the unwanted disruption from initial setup
- Manage the consistency from collaboration of the two layers :-
  - Infrastructure initialization
  - Model Building

On Demand or Application Based

- **User Defined Architecture**

  User perspective involves specifying:-

- Physical view (e.g. model size, weight, color, body specifications etc.)
- Functional attributes
- Interfaces
- Output

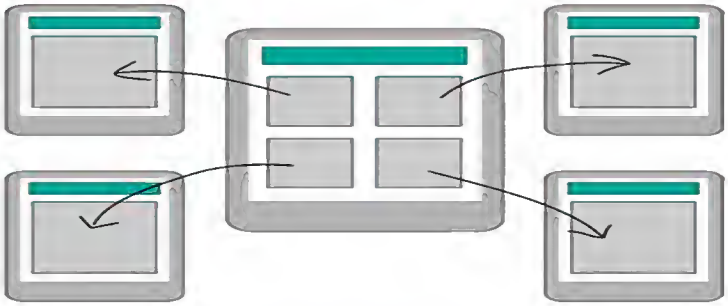

Figure 5: Demand Based User Defined Architecture

Based on User Application

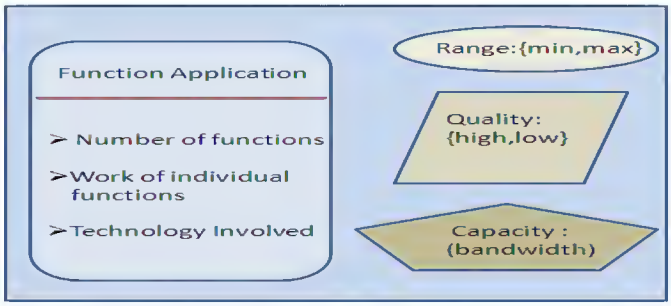

Figure 6: User Application Based Architecture

User perspective of design includes specifying:-

- **Functional Applications** - availability and capability of functions.
- **Range** of applications
- **Quality** of overall product or applications
- **Capacity** level of desired product.

Consistent Building

- **On the Basis of Environment**

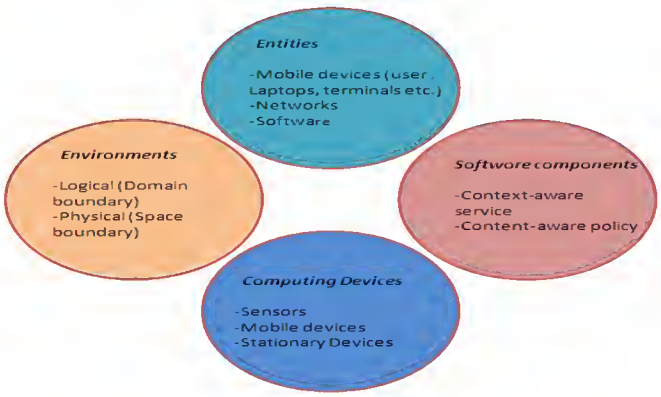

Figure 7: Consistent Building on Environment Basis

A high-level model of a system for context-aware regulated services, which consists of environments (domains and spaces), contextual software components, entities and computing devices.

Reliability of Design

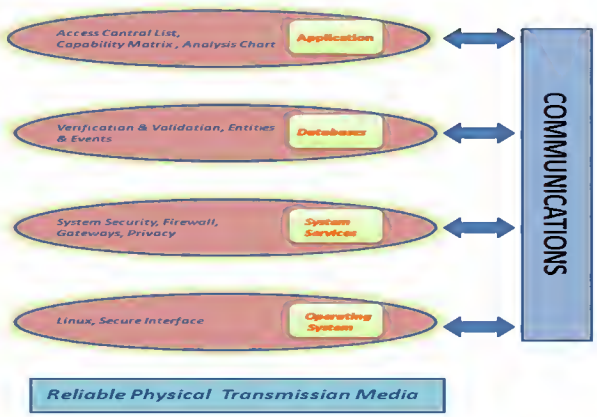

Figure 8: Consistent Architecture for Reliable Design

A major concern with Ubiquitous systems is reliability factor. The hardware, software as well as the supporting infrastructure should be reliable to construct a new network which must be up and running everywhere and every time. Reliability can exist individually or can be incorporated in the system as a whole.

SPS OF UBIQUITOUS COMPUTING

While building the Ubiquitous infrastructure of an application, three important design paradigms are considered:-

- Slice
- Pattern
- Style

Slice

- **Meaning of Slice**

Slice is the initial smallest unit of a Ubiquitous system. lt is the combination of internal components of the system where each component is designed through more than two configured items. ln other words, Slice is the Cl of lC's,

Where,

lC - lnternal component of system

CI - Configured ltems

Slice= {No. of lC, No. of Cl}

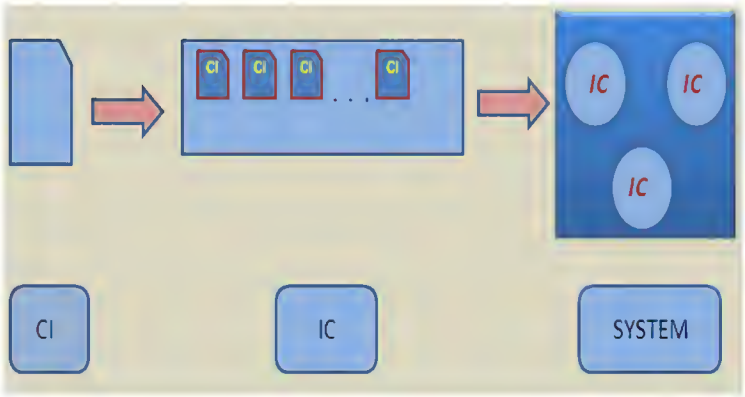

Figure 9: Graphical Representation of Slice

Where, IC is the internal component of the system. We know that the system is the combination of more than two internal components and each internal component is also manufactured from a combination of number of CI's.

Significance of Slice

In order to change the technology of the whole system we need to modify the internal component of the system.

To manage the internal component modification, we need to repair and modify the subpart of internal component named as CI.

Modification in System through Slice

When major changes in technology of system are acquired from the user perspective i.e. the lifecycle of the system requires modifications or a new system may be introduced.

Slice follows the IEEE standards for project development at initial level and applies forward engineering concept.

Application of Slice

The innovative research requires technological changes made from the slice level of product conservation/development. Andy Rubin made slice configuration in 2003 and invented a new operating system technology "Android" for user applications.

Patterns

Definition and Generation

When number of slices are accepted from customer to customer then it gives rise to innovative concept known as "Pattern". Pattern shows the increased application of slice.

Computation: Pattern is measured through the Probabilistic applicability of slice.

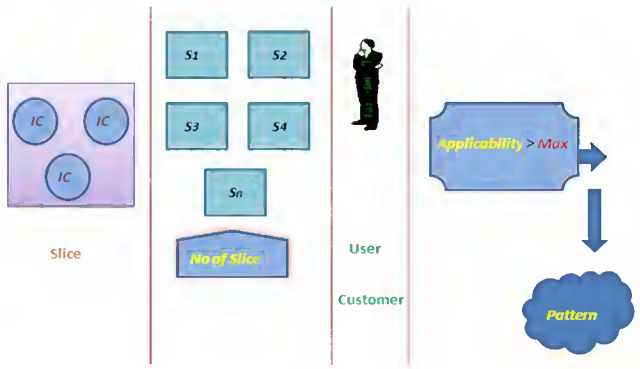

Figure 10: Graphical Representation of Pattern

Necessity of Pattern

Patterns are required when latest technologies are needed. Prevalence of new technological products distinguishes the system from common practices.

The following issues highlight the necessity of patterns:-

- Proceed to automated work
- Time saving
- Efficient utilization of advanced technology
- Enhanced control in distributed environment

Types of Patterns

Three major types of patterns can be defined:-

- Primary
- Intermediate
- Obsolete
- **Primary**: Initial level after the development; introduces a pattern having basic features.
- **Intermediate**: After refinement, to enhance the primary stage, a new stage of pattern is evolved known as Intermediate stage.
- **Obsolete**: After the maximum applicability of intermediate pattern, it transforms to style. After this stage the pattern is converted to style.

Limitation

- Generally new patterns are not accepted from user side due to the high cost considerations.
- Users are not well known about new paradigm of pattern design therefore they do not rely on the proposed pattern.

- As everyday new research is going on from proposal side as well as from simulation side, the user is not aware of the quality factor of simulated patterns.

Style

- **Basic Introduction about Style**

Style supplements the new rules to control the changes in the environment. It is centric to human body and applicable in all relevant environments. Generally it is adapted after deep analysis of introduced patterns.

Style has its Pros and Cons

- Better application of environments and full utilization of product
- Prior existence gets defeated and new concept is adopted with uncertainty.

Stages of Style

- **Acceptable:** "Promotes the style". Gives the different opinion and thoughts of people for current style and motivates them to promote and accept these technologies/products. Logically, acceptable style shows the maximum lifecycle of any product/ technology.
- **Declined**
- Existing technology hampers the acceptance of new style, due to the fear that the new technology might overcome their success.
- Acceptance from user perspective is also a major concern because a number of features might not be accepted by the user community.
- The acceptance of a new style is also dependent on market analysis and can impose several restrictions on the applicability of a new style.
- This phase cancels the style and demands a new style.

Applicability of Style into UC

Pervasiveness of style in UC leads to automation of work. Recurring changes should be incorporated in styles and acceptance of new style must be encouraged. Monotonous styles dormant the development of intelligent environments.

RESULTS & DISCUSSIONS

A set of configured items relating to electronics family has been analyzed at common temperature and environmental conditions using ALCATEL Reliability Prediction Method and the results obtained have been tabulated. The table highlights the performance attributes of configured items used in the system configuration.

Table 1: Performance of Configured Items (CI)

Component Family & Type		Reliability Prediction Method	Environment & Temperature		Component Parameters		Result		
Family	Part Name		Environment	Temperature (In Degree Centigrade)	Generic Name	Type	MTBF	Failure Rate (Per Million Hour)	Failure Rate (FIT)
Electronic	IC-Memory	ALCATEL	GB Ground Benign	25	55V16100FT	SRAM	26287151.75	0.038	38.0414
Electronic	IC-Analog	ALCATEL	GB Ground Benign	25	4 MSMD LP3984IBP-3.1	Linear	451456285.7	2.22E-03	2.2151
Electronic	IC-Digital	ALCATEL	GB Ground Benign	25	54ACT00FMQB	Gate/Logic Arrays	292531076.2	3.42E-03	3.4184

Table 1: Contd.,

Electronic	Resistor	ALCATEL	GB Ground Benign	25	R-1608I000DNT	RC	884614368.2	1.13E-03	1.1304
Electronic	Potentiometer	ALCATEL	GB Ground Benign	25	POT 10K	RVC	14123864.45	0.0708	70.8022
Electronic	Capacitor	ALCATEL	GB Ground Benign	25	C0402C102K5R ALTU	CDR	4914328748	2.04E-04	0.2035
Electronic	Switch	ALCATEL	GB Ground Benign	25	SW3-SPDT	Pushbutton Snap Action	1192913262	8.38E-04	0.8383
Electronic	Connector	ALCATEL	GB Ground Benign	25	C0NN JUMPER	Circular	2872974301	3.48E-04	0.3481
Electronic	HF Diode	ALCATEL	GB Ground Benign	25	DIODE SCHOTTKY 50V	VARACTOR	31254626.71	0.032	31.9953
Electronic	LF Diode	ALCATEL	GB Ground Benign	25	LCDA05	DIODE_SI	1507151496	6.64E-04	0.6635
Electronic	LF Transistor	ALCATEL	GB Ground Benign	25	2SK1527	FET_SI_MOSF	144198789.7	0.0069	6.9349
Electronic	HF Transistor	ALCATEL	GB Ground Benign	25	SKHI-21A	RF SI FET MOSFET	8155227.31	0.1226	122.6207
Electronic	FUSE	ALCATEL	GB Ground Benign	25	FUSE 2.5A		100000002.2	0.01	10
Electronic	Relay	ALCATEL	GB Ground Benign	25	RELAY SINGLE SIDE	DRY ARMATURE	424528850.5	2.36E-03	2.3556
Electronic	Filter	ALCATEL	GB Ground Benign	25	TX FILTER	CERAMIC-FERRITE	45454541.85	0.022	22

Consider the example of HF Diode which has Failure Rate of approx 31 signifying that the component fails after every 31 cycle of system operation. It means that after 31 cycles the system performance is affected and instead of changing the entire internal component the system performance may be improved through the replacement of simple configured item i.e., HF diode(DIODE SCHOTTKY 50V).

CONCLUSIONS & FUTURE SCOPE

In this paper we discussed Ubiquitous computing in three forms of design Slice, Pattern and Style. As technology changes from time to time the new design perspective will emerge from user side and so the designer always searches for new paradigm of design.

As Ubiquitous computing is dependent on the setup and interconnection of internal components of the system therefore we discussed common parameters of system component design. Here we distinguished the design paradigm at their initial level from slice to pattern and finally completed the architecture of system through applicability of style. We proposed three technological terms "SPS" and gave their definitions. The proposed technological terms are theoretically proved through the theoretical computer science concept. Each term has well defined architecture to prove their existence. These three terms SPS signifies the Initial, Intermediate and Final states of design paradigm.

Due to limited resources and time bounds we were unable to analyze these theoretical concepts to their maximum possibilities. The deployment of all these concepts require well equipped instrumented labs. Future researchers are invited to make sufficient effort for the future scope of SPS.

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